CLAIMS

What is claimed is:

1. A frequency tunable ferroelectric microwave component comprising:

(a.) a flexible metallic foil substrate;

(b.) at least one crystalline ferroelectric layer; and

(c.) a patterned thin metal layer

such that a controllable DC bias potential may be applied between the patterned thin metal layer and the metallic foil substrate.

2. The ferroelectric microwave component of Claim 1, wherein the at least one crystalline ferroelectric layer is selected from the group consisting of a lead lanthanide titanate, lead titanate, lead zirconate, lead magnesium niobate, barium titanate, lead lanthanum zirconate titanate, lead zirconate titanate, barium strontium titanate, lanthanum-modified lead zirconate titanate, bismuth zinc niobate and bismuth strontium tantalite.

3. The ferroelectric microwave component of Claim 2, wherein the at least one crystalline ferroelectric layer comprises lead zirconate titanate, barium strontium titanate, lanthanum-modified lead zirconate titanate, bismuth zinc niobate and/or bismuth strontium tantalite.

4. The ferroelectric microwave component of Claim 3, wherein the at least one crystalline ferroelectric layer is selected from the formula:

(a.) $(Ba_{1-x}Sr_x)TiO_3$, $PbZr_{1-x}Ti_xO_3$ or $Pb_y\ La_z\ (Zr_{1-x}Ti_x)O_3$ wherein x is between from about 0.1 to about 0.9, y is from about 0.95 to about 1.25 and z is between from about 0 to about 0.15;

(b.) $Bi_{3x}Zn_{2(1-x)}Nb_{2-x}O_7$ wherein x is between from about 0.40 to about 0.75.

(c.) $Sr_xBi_yTa_2O_{5+x+\ 3y/2}$ wherein x is between from about 0.50 to about 1.0 and y is between from about 1.9 to about 2.5.

5. The ferroelectric microwave component of Claim 1, wherein the metallic foil is selected from the group consisting of aluminum, brass, nickel alloy, nickel-coated copper, platinum, titanium and stainless steel foil.

6. The ferroelectric microwave component of Claim 1, wherein the ferroelectric thin film layer has a thickness in the range from between about 50 nm to 1000 nm.

7. The ferroelectric microwave component of Claim 1, wherein the metallic foil has either a flat surface, textured surface or macroporous surface.

8. The ferroelectric microwave component of Claim 1, wherein the flexible metallic foil substrate has a thickness in the range between about of 10 and 300 microns.

9. The ferroelectric microwave component of Claim 1, wherein the ferroelectric thin-film layer consists of multiple layers of dielectric materials in a regular or irregular superlattice structure.

10. The ferroelectric microwave component of Claim 1, wherein a barrier layer is interposed between the flexible metallic foil substrate and the ferroelectric thin-film layer.

11. A method of making a thin-film ferroelectric microwave component comprising:

(a.) depositing onto a flexible metallic foil substrate a precursor composition for a ferroelectric thin-film layer and heating until forming a ferroelectric thin-film layer; and

(b.) depositing onto the ferroelectric thin-film layer a patterned thin metal layer.

12. The method of Claim 11, wherein the deposited precursor composition is heated until a ferroelectric thin-film layer is formed having a thickness between from about 50 to about 300 nm.

13. The method of Claim 11, wherein the metallic foil has either a flat surface, textured surface or macroporous surface.

14. The method of Claim 11, wherein the flexible metallic foil substrate is selected from the group consisting of aluminum, brass, nickel alloy, nickel coated copper foil, platinum, titanium or stainless steel.

15. The method of Claim 11, wherein the flexible metallic foil substrate has a thickness in the range between about of 10 and 300 microns.

16. The method of Claim 11, wherein, prior to depositing the patterned thin metal layer, depositing at least one additional precursor composition for the ferroelectric thin-film layer onto the substrate.

17. The method of Claim 11, wherein, prior to depositing the at least one ferroelectric thin-film layer, a barrier layer is deposited onto the flexible metallic foil substrate.

18. A method of an antenna which comprises:

(a.) sol-gel depositing onto a flexible metallic foil substrate a precursor composition of a ferroelectric thin-film layer and heating until a ferroelectric thin-film layer is obtained; and

(b.) forming onto the ferroelectric thin-film layer a patterned microstrip patch having associated a bias connection and radial stub.

19. A method of manufacturing a ferroelectric antenna which comprises:

(a.) depositing onto a flexible metallic foil substrate for ground plane a precursor composition for a ferroelectric thin-film layer and heating until a ferroelectric thin-film layer is obtained; and

(b.) forming onto the ferroelectric thin-film layer a patterned thin metallic microstrip patch having associated bias connections and radial stubs.

20. The method of Claim 19, wherein the thickness of the ferroelectric thin film layer is between from about 50 nm to about 1000 nm.

21. An antennae comprising the ferroelectric microwave component of Claim 1.